connection with the work on the plantation. Although many such manuscripts have long since been destroyed, yet it is quite worth while to continue the search for such as remain, and we shall always be glad to print them in full or in abstract in the MONTHLY WEATHER REVIEW.—*C. A.*

LUNAR HALO AND LUNAR CORONA.

The following is an extract from a letter from Prof. John W. Harshberger, Philadelphia, Pa., dated December 22, 1901:

This evening, about 6 o'clock, I observed such a remarkable lunar halo and cloud formation that I thought a record might be of scientific interest.

The moon was about half way up to the zenith and was surrounded by an inner and an outer halo ring. The moon shone through a compact grayish-white cloud. Suddenly to the south of the moon a deep rift or crack appeared in the cloud, which reminded me of a huge ice crack made from bank to bank of a wide river. The clouds at once began to drift northward and the moon soon shone brightly through the sharply defined rift, which was just wide enough to accommodate the full diameter of the moon. At the same time the halo commenced to fade away and in twenty minutes had disappeared, but the clouds still resembled floe ice, the drift being toward east-northeast.

The small circles around the moon are diffraction circles and differ in origin from the large circles or halos. The former depend on the size and distance apart of the cloud particles, and a slight change in the texture of the cloud may make them disappear, while the large halos of 22° and 45° radius are more enduring. The small circles may originate in fog or haze that is quite near the observer; the larger halos generally belong to the clouds proper and have some local value as indicative of conditions that form approaching rain.—*C. A.*

WEATHER BUREAU MEN AS INSTRUCTORS.

Mr. T. B. Jennings, Section Director, Topeka, Kans., reports that on the 3d he addressed the older scholars of the Jackson School of that city on "The Weather Bureau and its instruments," and the teachers of the same school on "The Weather Bureau and its work." On the 4th he addressed the high school teachers and scholars, combining the above subjects into one lecture.

The Weather Bureau office at Macon, Ga., was visited on the 6th by the physical science class of the Bibb County Normal School, and the work of the office was explained by Mr. John R. Weeks, Observer in Charge, in an informal lecture.

The following is from the Sioux City, Iowa, Journal of December 10, 1901:

Last evening Mr. U. G. Purssell, in charge of the Sioux City office of the United States Weather Bureau, delivered the first number in a lecture course which has been inaugurated under the auspices of the South Sioux City High School and the management of Mr. C. P. Bowman, Superintendent of the Schools of that place.

Mr. Purssell devoted his remarks to the history of the Weather Bureau, its methods of work, and the benefit it has been to the people of the country. After speaking of the growth of the Bureau and the increasing influence of the service, Mr. Purssell entered into a description of weather stations about the country. He spoke of the equipments of these stations and the instruments used. He referred also to the Bureau's telegraphic system, the distribution of warnings and reports to the different interests affected by the weather. He told of the construction and the use of the weather maps, and spoke of the value of meteorological records and climatic data. He also made suggestions for the study of meteorology in the schools.

The lecture was heard by a good audience, which showed much interest.

Mr. J. J. Kelliher, Observer, United States Weather Bureau, Pocatello, Idaho, reports that on the 18th the class in physical geography in the High School of that city visited the Weather Bureau office, and that he exhibited and explained the various meteorological instruments in use.

We quote the following from the Minneapolis, Minn., Journal of November 10, 1901:

Weather maps for schools.—Observer Outram, of the Weather Bureau, receives many calls from the schools in the Northwest and in Minneapolis for sets of weather maps covering several consecutive days. The charts are very helpful in the study of the physics of the atmosphere, since they enable the instructor to point out the movements of the high and low areas, the areas of precipitation, and other interesting meteorological phenomena.

Mr. S. S. Bassler submits the following outline of a course in meteorology which he is to give at the University of Cincinnati, commencing with the second term of the current collegiate year:

A COURSE IN ELEMENTARY AND PRACTICAL METEOROLOGY.

Object of course.—The course is intended to give a knowledge of the leading facts concerning the atmosphere and its phenomena, and to enable the student intelligently to interpret a weather map and make a forecast therefrom.

Outline of the course.—Short talks, in connection with the text-book, on the subjects temperature, pressure, wind, moisture, cyclones and anticyclones, weather and weather maps, proverbs, and forecasting will be given in the order named. Laboratory work in connection with these subjects, singly and in combination, will establish the correlation between them and between general and local weather conditions. The course as outlined in detail largely contemplates self instruction, more especially in the practical part, through observation and reasoning.

Text-book.—Waldo's Elementary Meteorology.

Reference book.—Davis's Meteorology.

Time.—One hour (or more) each alternate Saturday afternoon during the second and third terms, with supplementary hours of study, observation, and practise in the use of instruments and the construction of weather maps.

Work.—Careful study of the text-book as a basis, concise written explanation of problems in the current lesson, essay writing and practise work as prescribed. Base maps and data for map practise will be furnished.

Equipment.—The text-book, the reference book (optional), a note book, blank base maps of the United States, lead pencils, and a red and blue pencil.

Note.—Should the class not be too large, this instruction will be given in the private office of the local forecast official, with whom arrangements may be made.—*H. H. K.*

HALO OF HEVELIUS.

Rev. Frederick Odenbach, S. J., Professor of Physics in St. Ignatius College, Cleveland, Ohio, sends us the following account of his observations of the halo of Hevelius, on December 6, 1901. This was first published in the Cleveland Plain Dealer, December 7, 1901, but numerous corrections have since been made by Father Odenbach.

Preceding a period of low barometric pressure, halos are often noticed about the sun. The commonest of these appear at a distance of 22° from the sun; an outer halo, at a distance of 46°, is also occasionally noted; but the great halo of Hevelius, at a distance of 90°, is a great rarity. At times when these halos are visible, there is also visible a parhelic circle passing through the sun and intersecting the halos. At the points of intersection of the parhelic circle with the halos are formed balls of light, which are known as "mock suns," "dog suns," or "sun dogs." These mock suns are really not reflections of the sun at all, but are merely intensified points of light at the intersections of two light circles. They are scientifically known as parhelia. Tangent to the halos are also occasionally noted tangent circles of equal radius. These are known as contact circles.

Yesterday the inner circle of 22° was complete, portions of the 46-degree circle were distinct, and the great circle of Hevelius was distinct

for half its circumference. Portions of the parhelic circle were visible, and a part of the contract circle to the halo of 46° was the most brilliant and resplendent part of the entire display. Parhelia, or mock suns, were visible on the 22-degree and the 90-degree circles.

The great circle of Hevelius is located at such a great distance from the sun that the whole of its circumference can never be visible. Father Odenbach was working by an eastern window in his observatory when he glanced from his book and noticed a peculiar luminous circular cirrus cloud, as he supposed. He continued his work, but upon glancing up about fifteen minutes later he noted that the supposed cloud had not moved from its former position. He at once saw that it could be no cloud and ran to the roof of his observatory, where the whole series of phenomena was spread out before his eyes.

In the quarter of the heavens opposite to the appearance which he had seen from his window, Father Odenbach saw an exactly similar parhelium or "sun dog." Extending between the two was the great 90-degree circle or halo of Hevellus. Within this were visible portions of the 46-degree circle, with a most brilliant arc of the tangent circle floating in the sky like a rainbow-hued crescent. Within this, resplendent with every color, was the common halo of 22°. Near the points of contact with the halos portions of the parhelic circle were also visible, making brilliant sun dogs at the inner circle, and causing the parhelia on the halo of Hevelius which first attracted the observer's attention. At the point of contact with the 46-degree circle the appearance was not so marked, but traces of the mock suns were noticeable.

It was shortly before 11 o'clock when Father Odenbach first observed the display. It continued undiminished for an hour, but after noon it began to fade. The inner halo, however, was visible all the afternoon.

The inner halo of 22° is caused by crystals of ice in the atmosphere. They have angles of 60°, and the halo is always at the fixed distance of 22° from the sun. This halo contains all the colors of the rainbow, but their order is transposed, the red being on the inner edge, and the violet on the outer.

The halo of 46° is also caused by ice crystals in the air, with the difference that the light passes through the terminal faces inclined at angles of 90°. This halo is not nearly so common as the inner halo, but it has the same rainbow hues.

The great 90-degree circle, or halo of Hevelius, differs essentially from the two inner halos. In the first place it is not rainbow hued, but is merely a band of white light This great halo was first seen by Hevelius, whose name it bears, on February 20, 1661. For some reason the contact arch to the 22-degree circle was not visible yesterday, although that halo itself was very brilliant, while the contact arch to the 46-degree circle was distinct and lustrous in spite of the fact that the 46-degree circle was scarcely discernible. This contact arch was distinctly visible up to 4 o'clock. Throughout the display nothing was visible south of the sun, except a portion of the 22-degree halo. This was due to the hazy and smoky condition of the atmosphere near the horizon.

To summarize this great meteorological display, there were visible yesterday one halo of 22°, one halo of 46°, one halo of 90°, one contact arc of 46°, two mock suns of 22°, and two mock suns of 90°.

The following extracts are from Weather Bureau daily journals for December 6, 1901:

Cleveland, Ohio: Parhelia 22.5° from the sun were observed from 11:45 a. m. to 12:15 p. m., and a tangent halo of 45° radius from 11:45 a. m. to noon. At the station there was considerable smoke present in the air most of the day.

Detroit, Mich.: Faint complete solar halo observed from 10:15 a. m. to 10:40 a. m. Partial solar halo with bright parhelia observed from 1:30 to 2:15 p. m.

Sandusky, Ohio: Very brilliant solar halo with parhelia, and also a brilliant colored arch, red side toward the sun, was observed near the zenith, the convex side being toward the sun and probably 46° from it. This phenomenon prevailed from 12:30 to 2:20 p. m.

Toledo, Ohio: Quite a distinct solar halo of 22° radius was observed during most of the morning from 9 a. m. and ending about noon, with a fainter halo of 45°. A white parhelic circle passing through the sun made a bright parhelion at either intersection with the halo of 22° radius, but there was no visible parhelia at the intersections with the halo of 45°; a faint parhelic circle intersected the halo of 45° and was tangent to the halo of 45° making a very bright contact arch which was plainly visible for a long time.

Richmond, Va.: At about 8 a. m. a solar halo was visible. It consisted of a segment of a circle with prismatic colors about 22° northwest of the sun and having its concave side to the sun. The colors were very distinct. It was accompanied by a sun dog about 10° north of the sun. The display lasted until 10 a. m.

Springfield, Mo.: Faint solar halo 4:10 p. m.

On the morning of the 6th an area of high pressure was central over Ontario, Canada, and an area of low pressure over South Dakota. Most of the stations along the lower lakes and immediately to the west reported the sky partly overcast with cirro-stratus or alto-stratus clouds; farther west the sky was completely overcast with lower clouds, and at some stations rain or snow was falling. At 8 p. m. the lower lake stations reported very few clouds, but on the following morning they were well under the influence of the low barometer area and its attendant cloudiness.

It thus appears that these brilliant solar halos were formed in the layer of upper clouds that usually precedes a barometric depression.—*H. H. K.*

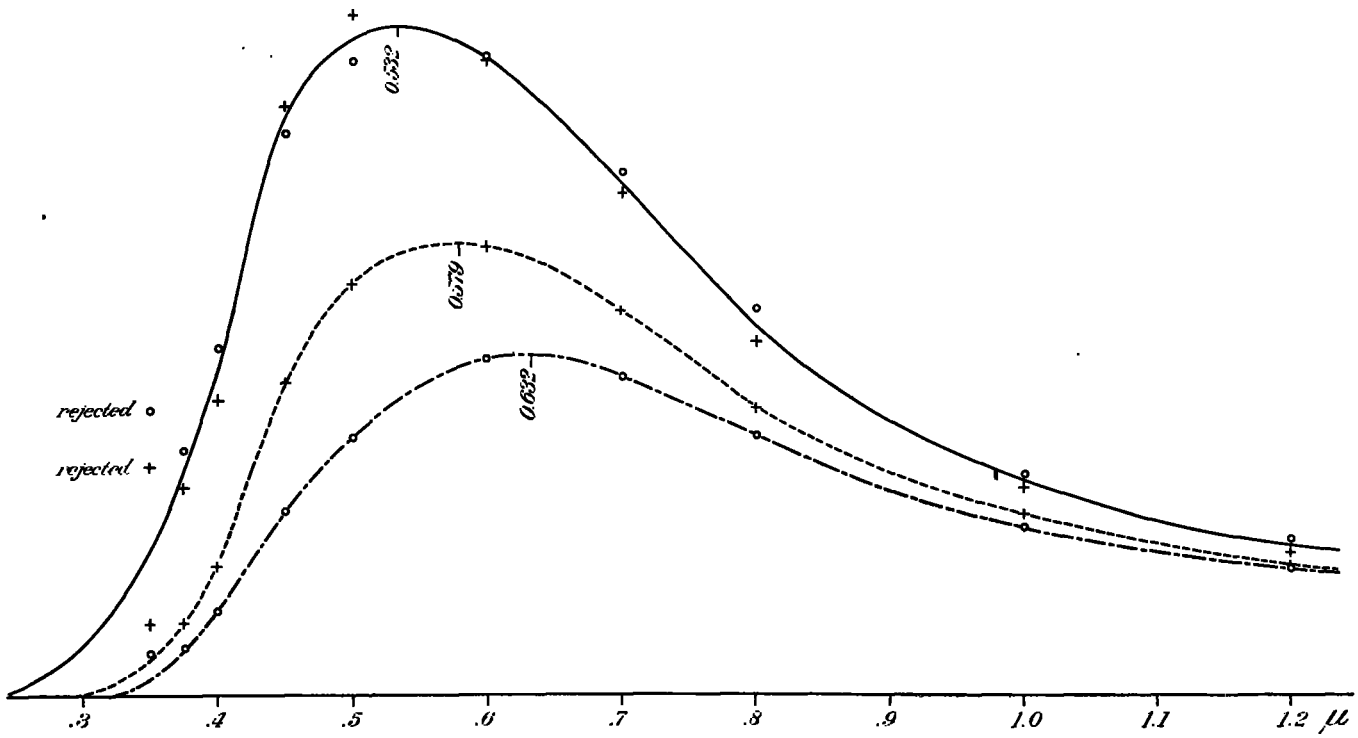

FIG. 1.—Spectral energy curves.

CORRIGENDA.

MONTHLY WEATHER REVIEW for August, 1901, page 362 column 1, line 3 from bottom, for

$$p=\left(\frac{1+\varepsilon_1}{1+\varepsilon_2}\right), \text{ read } p=\left(\frac{1+\varepsilon_1}{1+\varepsilon_2}\right)^m .$$

Page 363, column 1, dele all of line 20 after "curves." and all of line 21, and insert the following in its place:

"In connection with the spectral energy-curves shown in fig. 1, the circles indicate Langley's Lone Pine high-sun observations, August 11, 12, and 14, 1881, and values outside the atmosphere computed from the same. The crosses indicate Mount Whitney observations, September 1, 2, and 3, 1881, and outside values computed by formulæ R and D. Maxima are shown at the following points:" (See fig. 1 on preceding page.)

THE WEATHER OF THE MONTH.

By ALFRED J. HENRY, Professor of Meteorology.

CHARACTERISTICS OF THE WEATHER FOR DECEMBER.

The month of December, 1901, was characterized by heavy rainfall in the eastern and southern sections and by abnormally cold weather in the central and southern districts. A severe cold wave swept across the country from west to east on the 13th, 14th, and 15th. The cold wave was preceded in the Middle Atlantic and New England States by heavy rains and more or less destructive floods. A second period of heavy rain set in toward the end of the month, causing a number of rivers in the Middle and South Atlantic States to pass beyond the flood stage. The weather on the Pacific coast was cloudy and rainy during the first ten days of the month; thereafter, generally fair weather prevailed especially in California and the central and southern Plateau region.

PRESSURE.

The distribution of monthly mean pressure is graphically shown on Chart IV and the numerical values are given in Tables I and VI.

Pressure was below the normal in all portions of the country, except the north Pacific coast, the northern Plateau, and thence southeastward and southward to the Mexican boundary and western Texas. The high over the South Atlantic States was perceptibly weaker than usual although the high over the ocean seemed to be fairly strong. Monthly mean pressure, as compared with the previous month, fell in the interior of the country and rose on the New England coast, also from the Rocky Mountains westward to the Pacific

TEMPERATURE OF THE AIR.

The distribution of monthly mean surface temperature, as deduced from the records of about 1,000 stations, is shown on Chart VI.

The month was colder than usual in the interior of the country, the South Atlantic States, and Florida. West of the Rocky Mountains and over the northeastern Rocky Mountain slope mean temperature ranged from 3° to 7° above the normal. Temperature was also above the normal in northeastern New England and over the Canadian Maritime Provinces. The greatest negative departures were in the lower Ohio and middle Mississippi valleys, where monthly mean temperature was as much as 6° below the seasonal average. Maximum temperatures of 80° and over were registered only in Texas, southern Louisiana, southern Florida, southwestern Arizona, and southern California. In the upper Lake region and northern Minnesota the maximum temperature of the month did not at any time exceed 40°. Minimum temperatures of zero and lower were registered over the greater part of the central and northern districts, and freezing temperatures prevailed to the Gulf coast and over the peninsula of Florida as far south as Tampa.

The average temperature for the several geographic districts and the departures from the normal values are shown in the following table:

Average temperatures and departures from the normal.

Districts.	Number of stations.	Average temperatures for the current month.	Departures for the current month.	Accumulated departures since January 1.	Average departures since January 1.
		°	°	°	°
New England	10	30.8	+ 0.4	− 1.9	− 0.2
Middle Atlantic	12	34.6	− 1.7	− 4.1	− 0.3
South Atlantic	10	45.8	− 2.8	−17.0	− 1.4
Florida Peninsula	7	58.3	− 3.0	−20.3	− 1.7
East Gulf	7	47.4	− 4.9	−15.4	− 1.3
West Gulf	7	47.7	− 3.7	+ 7.7	+ 0.6
Ohio Valley and Tennessee	12	32.7	− 5.4	−10.1	− 0.8
Lower Lake	8	27.4	− 3.1	− 2.0	− 0.2
Upper Lake	9	31.6	− 2.9	+11.1	+ 0.9
North Dakota	8	12.4	− 0.3	+25.5	+ 2.1
Upper Mississippi Valley	11	23.3	− 5.1	+14.9	+ 1.2
Missouri Valley	10	24.6	− 4.7	+29.3	+ 2.4
Northern Slope	7	25.9	+ 1.3	+28.3	+ 2.4
Middle Slope	6	32.8	− 2.0	+20.9	+ 1.7
Southern Slope	6	39.9	− 1.8	+14.0	+ 1.2
Southern Plateau	15	39.8	+ 1.4	+ 9.5	+ 0.8
Middle Plateau	9	30.0	+ 2.2	+19.5	+ 1.6
Northern Plateau	10	32.0	+ 1.5	+20.8	+ 1.7
North Pacific	9	41.5	− 0.3	− 1.1	− 0.1
Middle Pacific	5	49.8	+ 1.2	+ 2.1	+ 0.2
South Pacific	4	54.6	+ 1.8	+ 6.3	+ 0.5

In Canada Prof. R. F. Stupart says:

The extreme western and southwestern counties of the Province of Ontario were the only portions of the Dominion where the mean temperature of the month was below average, the greatest departure, about 5°, being in Essex. Near the shores of Lake Ontario and the Georgian Bay the mean was nearly average, and thence northward and eastward a positive departure increased to 3° or 4° in the Ottawa Valley and western Quebec and to 6° in eastern Quebec. In Nova Scotia and Prince Edward Island the average was exceeded by between 3° and 6°; in Manitoba and Assiniboia by nearly the same amount, while further northward and westward in the Territories, in Saskatchewan and Alberta, the positive departure from average was from 6° to 9°. In British Columbia a positive departure of 3° near the Selkirk range diminished gradually toward the coast.

PRECIPITATION.

On the whole the month was one of abundant rainfall. More than 100 per cent of the normal precipitation was recorded in ten of the twenty-one districts into which the country has been divided, and in five others more than 75 per cent of the normal was registered. The greatest positive departures occurred in the eastern section and extended over a considerable belt of country between Mississippi on the southwest and New England on the northeast. In Texas and